INSTRUCTION & MAINTENANCE MANUAL
FOR
WEINSCHEL DOUBLE STUB TUNERS
DS-109* SERIES

A277 CAL LAB
μ WAVE

WEINSCHEL ENGINEERING

GAITHERSBURG, MARYLAND

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INSTRUCTION & MAINTENANCE MANUAL
FOR
WEINSCHEL DOUBLE STUB TUNERS
DS-109* SERIES

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μ WAVE

*U.S. Patent #2,941,169

IM #52
November 1964

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ASSEMBLY AND OPERATING INSTRUCTIONS
WEINSCHEL DOUBLE STUB TUNERS

Models DS-109, DS-109L, DS-109LL, DS-109M, and DS-109H

To facilitate shipping, Weinschel double stub tuners are sent to customers disassembled. For re-assembly and use, these steps should be followed:

Assembly

1. Check the plate on tuner base and determine which stub positions should be used for ease of matching at the frequency in use.

2. Insert the stubs into these two ports by the following process:

   2.1 Hold the stub vertically and perpendicular to the main body, about 3 inches above a desired port.

   2.2 Slide the center conductor of the stub down and insert it into the tapped hole in the body center conductor. While holding the outer tube, screw the stub center conductor down hand tight.

   2.3 Next, slide the stub outer tube down until its threads engage with the tapped hole of the tuner body. Screw the outer tube down hand tight.

   2.4 Insert a thin screwdriver through opening on top of stub outer tube and screw down stub center conductor firmly. Recheck outer tube to assure it is well seated.

   2.5 Repeat steps 2.1 through 2.4 to place remaining stub in its proper port.

Use

The tuner can be used to reduce mismatches as great as seven or eight to one as follows:

1. Be sure the proper stub ports have been selected for the frequency range in use.

2. Install the stubs as outlined in assembly procedures (above).

3. *Adjust the stubs individually while checking convergence on the system VSWR indicator. This is evidenced by the VSWR being reduced toward a 1::1 condition. When approaching the matched condition, it is best to alternately adjust first one stub and then the other, using small increments. This will then minimize "overshoot" and aid in faster tuning.

4. When changing frequency range, again consult chart on base for correct positions. Repeat steps 1 through 3 (above).

*For DS-109M, keep datum line on stub outer tube faced toward front of tuner. This will aid in repeating match point when detuning and retuning.

MAINTENANCE AND HANDLING INSTRUCTIONS
WEINSCHEL DOUBLE STUB TUNERS

Models DS-109, DS-109L, DS-109LL, DS-109M, and DS-109H

The DS-109 series of double stub tuners is a line of laboratory instruments designed to tune out mismatch conditions in coaxial systems. Constructed of corrosion resistant materials by skilled craftsmen, these devices have been thoroughly tested to assure conformance with mechanical and electrical specifications.

While designed for long service, some care should be exercised in their use; much the same as for any fine instrument. To enhance their performance and usefulness to the customer, it is recommended the following be observed:

Maintenance

Only minimum care need be exercised here. The tuner should not be subjected to extremely dusty or dirty work areas, as accumulations of foreign matter may tend to affect the tuning ease, resolution and repeatability (especially so of the micrometer types). Should erratic or non-repeatable adjustments occur, the following action has been shown effective by experience:

1. Disassemble stubs and clean all parts with a good commercial low residue solvent such as toluene or pax.

2. Sliding contact fingers should be checked for wear. This is about the only cause of tuning problems and can be corrected in mild cases by slightly spreading or compressing the tines for good mechanical and electrical performance. Should the wear be excessive, replacement parts may be ordered from the factory.

3. After cleaning and adjusting, lubricate the sliding and contact surfaces with an extremely thin film of a good grade conductive lubricant (Moly-Cote-G, Lube-Rex, etc.).

4. Should a problem still exist, return the unit to our factory for repair.

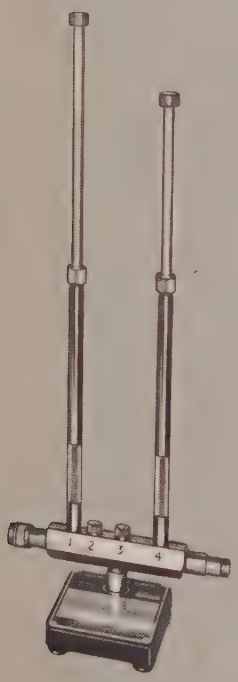
Handling

When handling or using the instrument, one should assure that the stub center conductor is screwed firmly into the body center conductor, and that the outer stub tubes are screwed down hand tight. Otherwise, normal use should not damage the tuner. When transporting the tuner or tightening the stubs down, the following should always be observed:

1. DO NOT carry the tuner by the stubs. This can cause bending of the tuber with resultant poor performance.

2. DO NOT use pliers, vise-grips, etc., for tightening the various knurled thumbscrews. The tuner should perform satisfactorily with all adjustments hand-tight. If intermittent readings occur, refer to the maintenance paragraph above.

DOUBLE STUB TUNERS MODELS DS-109, 109H, 109L AND 109LL* 40 MC - 10 GC



DS-109
0.75 - 10 GC

DS-109L
0.4 - 4 GC

DS-109LL
0.2 - 2 GC

FEATURES

COLLET TYPE LOCKS—Each tuner is equipped with collet type locks to prevent accidental movement of the stubs after adjustments are made.

ADJUSTABLE DISTANCE BETWEEN STUBS—Each tuner has four possible stub locations, enabling the stubs to be set at the most favorable of six available spacings to permit rapid convergence during the matching process.

ADJUSTABLE HEIGHT OF CONNECTORS—The tuners are mounted on pedestals and the vertical spacing between the pedestal and the center line of the connectors is adjustable. The tuners can easily be set-up in line with practically all commercially available slotted lines and still have their weight completely supported without mechanical load on the connectors.

STAINLESS STEEL CLOSE TOLERANCE CONNECTORS—These tuners are equipped with precision type "N" connectors. To protect their close tolerances, the connectors are made of long wearing stainless steel.

*U.S. Patent Number 2,941,169

APPLICATIONS

These tuners are variable radio frequency impedance transformers which can be used to match a wide range of impedances. The most common use is to transform a load impedance to the impedance of a transmission line feeding the load so as to maintain a low standing wave ratio on the line.

DESCRIPTION

To match a wide range of impedances, Weinschel tuners are provided with adjustable spacing between the stubs. A spacing can be selected for each frequency to obtain a rapid convergence to a match. Each tuner is provided with a permanently mounted instruction plate indicating the preferred stub position for rapid convergence in a particular frequency range. In those rare cases where the load impedance falls outside the

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Gaithersburg, Maryland/Santa Monica, California

range of the tuner, it can be brought into range by inserting a quarter wavelength line between the tuner and the load. Due to the wide spacing available, these tuners are useful below their low frequency limits with some deterioration in the rapidity of convergence and the resulting convenience in use.

Another factor of importance is the ease with which adjustments can be made. The stubs are designed so that the sliding contacts are removed from the high current point of the short, thus greatly reducing the noise produced when the short is in motion. Collet type locks are provided to prevent accidental movement of the stubs after they have been adjusted.

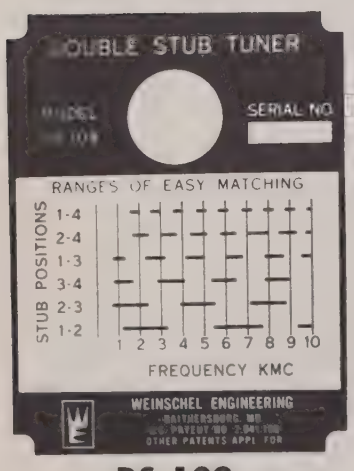
Weinschel double stub tuners are provided with stands having a height adjustment to permit convenient use with practically all commercially available slotted lines.

The Model DS-109H differs from the other models in that it utilizes a helical inner conductor in both the stubs and the body between the stubs giving the unit an electrical length much greater than its mechanical length. A 53 centimeter travel of the stubs corresponds to a change of more than 380 centimeters in their electrical length.

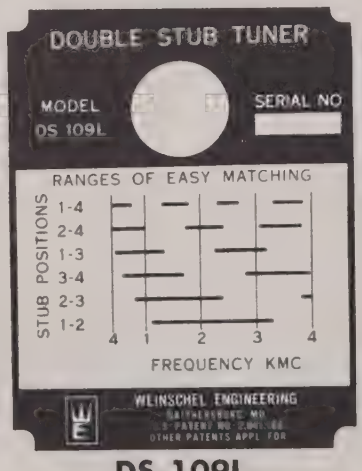
SPECIFICATIONS

Model Number	DS-109	DS-109L	DS-109LL	DS-109H
Frequency Range	0.75 - 10 GC	0.4 - 4 GC	0.2 - 2 GC	40 - 400 MC
Impedance Match (to 50 ohm line within specified frequency range)	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0
Line Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Length of Stub Travel	20.5 cm.	38 cm.	76 cm.	53 cm.
Overall Length	6⅛ in.	6⅛ in.	12 in.	12 in.
Overall Height	12½ to 20¾ in.	20½ to 35¾ in.	36¼ to 66½ in.	25⅛ to 48¾ in.
Connectors	Stainless steel type "N" one male and one female	Stainless steel type "N" one male and one female	Stainless steel type "N" one male and one female	Stainless steel type "N" one male and one female
Height of Connector from Base	2⅜ to 3¼ in.	2⅜ to 3¼ in.	2⅜ to 3¼ in.	2⅞ to 3¼ in.
Shipping Weight	5 lbs.	6 lbs.	12 lbs.	12 lbs.
Price	$150.00	$165.00	$190.00	$250.00

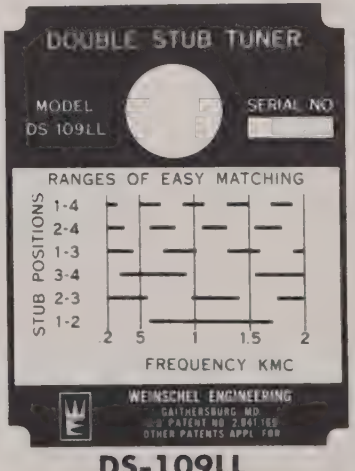
SAMPLE NAMEPLATES



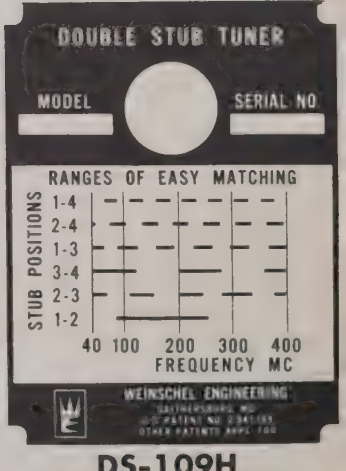
DS-109



DS-109L



DS-109LL



DS-109H

Our Applications Engineering Department welcomes inquiries for coaxial components to meet special requirements.

DESIGNERS AND MANUFACTURERS OF PRECISION MICROWAVE EQUIPMENT

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GAITHERSBURG, MARYLAND • TEL: AREA CODE 301; 948-3434 • TWX: 301-926-3730
SANTA MONICA, CALIFORNIA • 1318 SECOND STREET • TWX: 213-879-0490 Phone: 213-394-1154

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RESETTABLE DOUBLE STUB TUNER

DS-109M **.75—10 GC**

FEATURES

ACCURATE RAPID RESETTING—Once a tuning setting has been determined, it can be repeated by adjusting the coarse and fine settings to their previously determined positions. Settings made in this manner repeat within a range of .005".

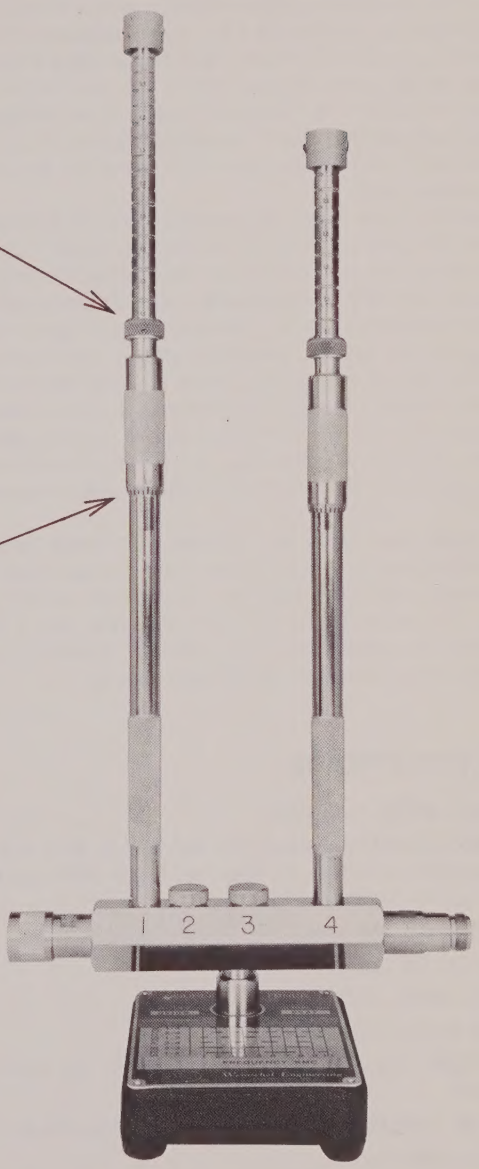
COLLET TYPE LOCKS—Each stub is equipped with a collet type lock on the coarse adjustment to prevent accidental movement.

ADJUSTABLE DISTANCE BETWEEN STUBS—Each tuner has four possible stub locations, enabling the stubs to be set at the most favorable of six available spacings to permit rapid convergence during the matching process.

ADJUSTABLE HEIGHT—The tuner is mounted on a pedestal and the vertical spacing between the pedestal and the center line is adjustable. The tuner can easily be set up in line with practically any commercially available slotted line and still have its weight completely supported without mechanical load on the connectors.

STAINLESS STEEL CLOSE TOLERANCE CONNECTORS—This tuner is equipped with precision type N connectors. To protect their close tolerance, and to provide long useful life, the connectors are made of stainless steel.

FINE TUNING—The micrometer adjustment provides an excellent fine tuning control, permitting easy location of the optimum balance setting.



DS-109M, resettable double stub tuner

APPLICATIONS

Double stub tuners are standard microwave accessories used both in the laboratory and on the production line. The most common application is to "match" or transform a load impedance. They are also used extensively to optimize the transfer from a generator to a load.

A more specialized application is the matching of a transition from a slotted line to a cable. This is a common problem when measuring the VSWR of cable connectors. Here the reset feature is indispensable if such measurements are to be made over a band of frequencies. Using the DS-109M, the transition is first matched at each test frequency and the stub settings recorded. The connector is then inserted and the tuner settings restored at each test frequency to make the connector VSWR measurement.

There are many other specialized applications for stub tuners. In all applications, the resettable feature and the vernier control on the Model DS-109M increases the usefulness of the tuner as well as the efficiency of the operator.

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Gaithersburg, Maryland/Santa Monica, California

RESETTABLE DOUBLE STUB TUNER

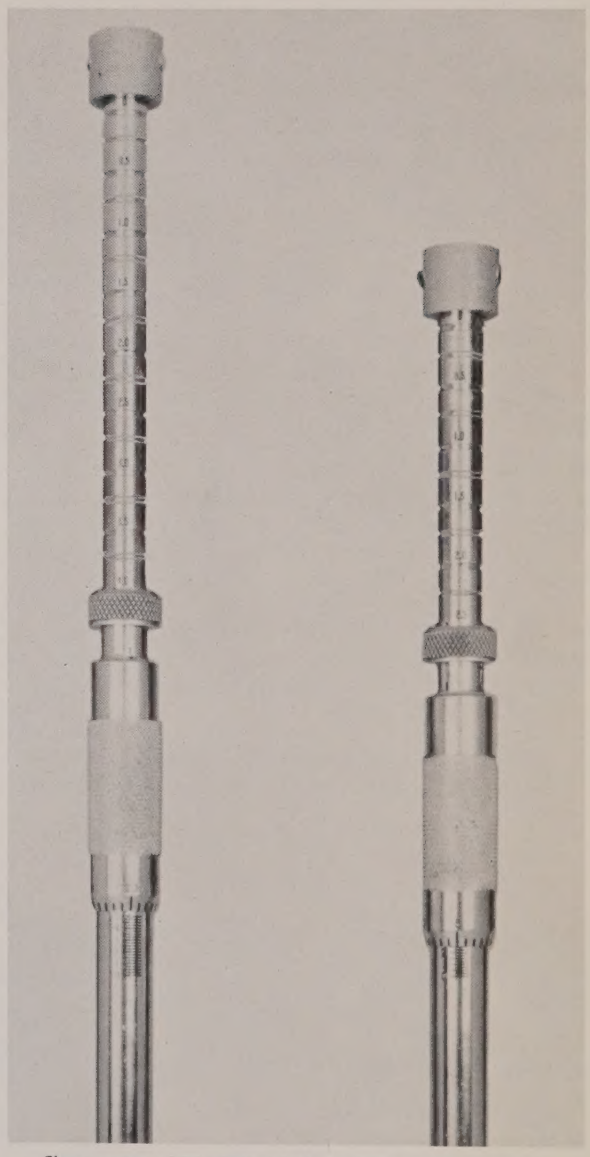
DS 109M .75-10 GC

DESCRIPTION

The W Model DS-109M Double Stub Tuner is made with two resettable adjustments on each stub. Circumferential grooves at 0.25″ intervals along each stub provide a fast and accurate coarse setting. This adjustment can then be locked using a sliding collet. A micrometer type control with a 0.5″ range calibrated in 0.001″ increments is used for fine tuning. With dual adjustment the mechanical setting can be repeated quickly and easily with a precision of ±0.0025″. The micrometer control serves another extremely useful purpose since it makes it easy to move the stub smoothly and in very small increments to permit true fine tuning of the balance point.

To match a wide range of impedances, the W DS-109M is provided with adjustable spacing between the stubs. A spacing can be selected for each frequency to obtain a rapid convergence to a match. The tuner is provided with a permanently mounted instruction plate indicating the preferred stub position for rapid convergence in a particular frequency range. In those rare cases where the load impedance falls outside the range of the tuner, it can be brought into range by inserting a quarter-wavelength line between the tuner and the load. Due to the wide spacing available, the tuner is useful below 750 Mc with some deterioration in the rapidity of convergence and the resulting convenience in use.

W double stub tuners are provided with stands having a height adjustment to permit convenient use with practically any commercially available slotted line. This feature permits supporting the weight of the tuner on the stand, rather than attempting to support this weight through connectors, thus avoiding one source of instability in measurements.



Close-up view of DS-109M stub showing fine tuning micrometer.

SPECIFICATIONS

FREQUENCY RANGE—.75—10Gc.

IMPEDANCE MATCH—Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0 can be matched to 50 ohms.

LINE IMPEDANCE—50 ohms.

LENGTH OF STUB TRAVEL—20.5 cm.

OVERALL LENGTH—6⅛″.

OVERALL HEIGHT—12½ to 20¾″.

CONNECTORS—Stainless steel, precision type N, one male, one female.

HEIGHT OF CONNECTOR FROM BASE—Adjustable from 2⅜ to 3¼″.

SHIPPING WEIGHT—7 lbs.

PRICE—$250.00

Terms are net 30 days, subject to approval of credit. All prices are F.O.B. Gaithersburg, Maryland, and include commercial packing for domestic shipment within the continental United States. Prices and specifications are subject to change without notice.

Our Applications Engineering Department welcomes inquiries for coaxial components to meet special requirements.

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